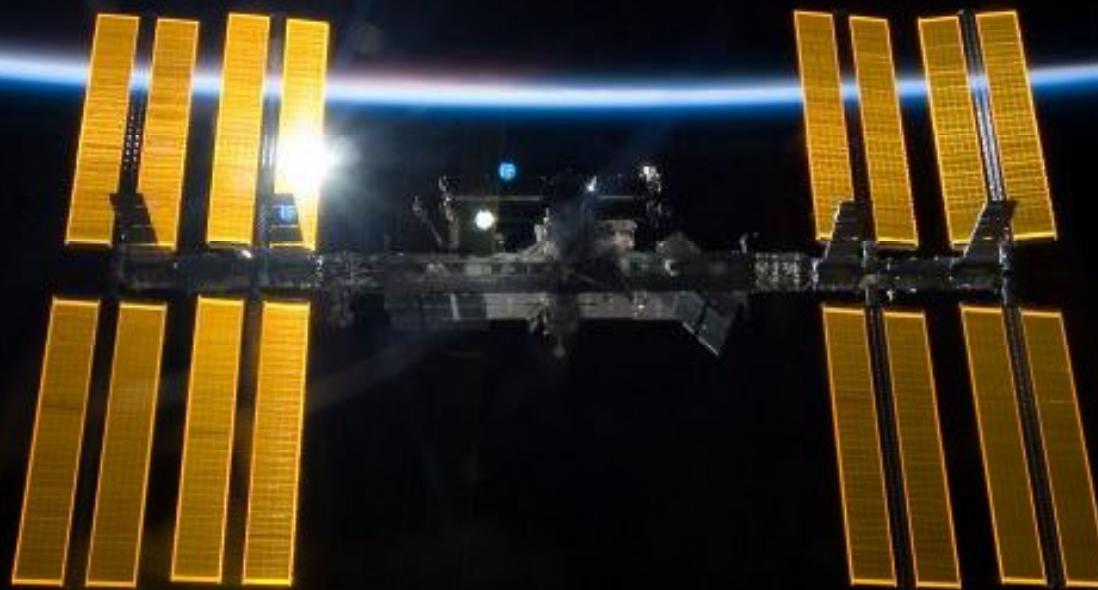


Space Paradigm Shift

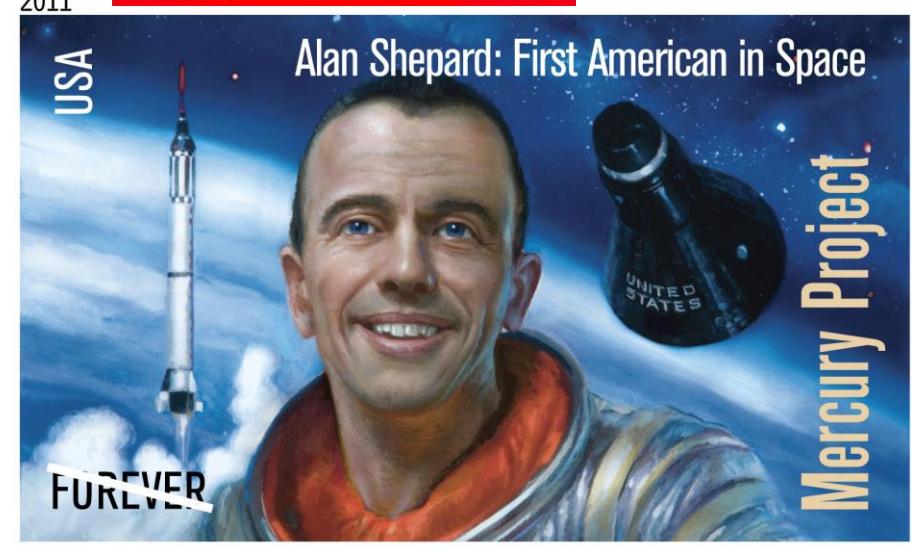
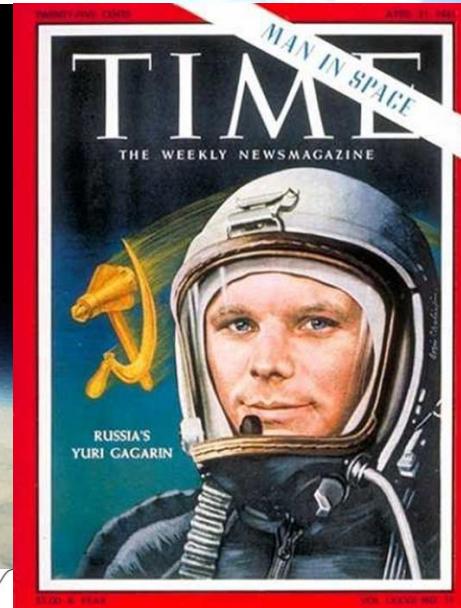
*Bruce Pittman
Space Portal Office*



Space Paradigm Shift

- A paradigm is a set of rules or a model for how to solve problems and achieve success
- Described by Thomas Kuhn 1962 in his book “The Structure of Scientific Revolutions”
- The international space program is undergoing a major paradigm shift and this shift provides a window of opportunity for innovation and for new players to enter

Start of the Space Race



May 25, 1961 - Apollo Is Born



USA Wins!

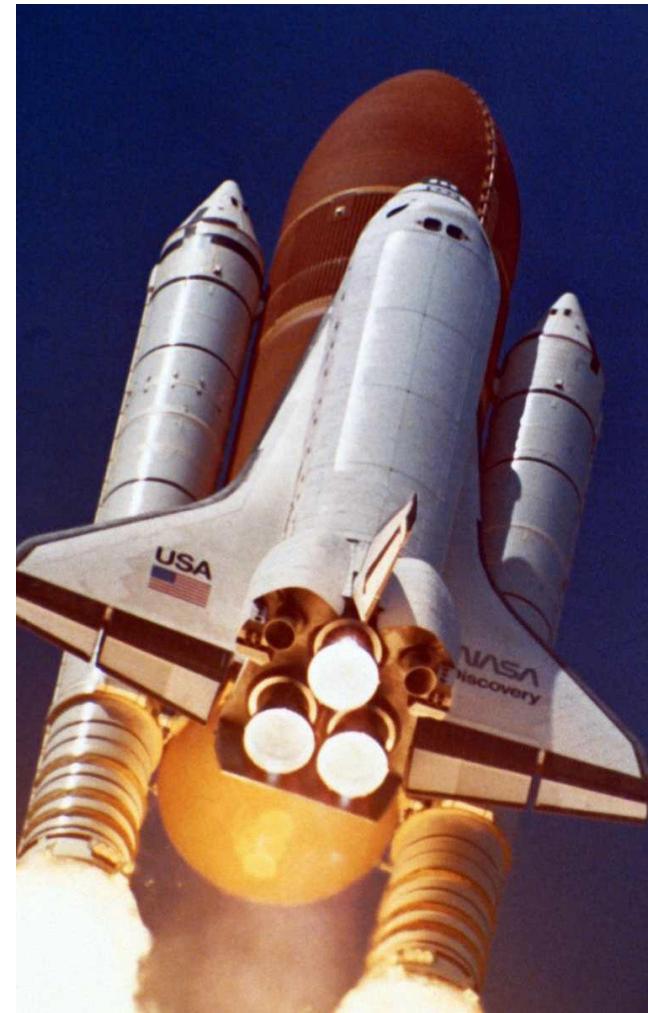


Space Paradigm Shift

	<i>Old Paradigm</i>	<i>New Paradigm</i>
Funding	<ul style="list-style-type: none">• Government	<ul style="list-style-type: none">• Govt & Private
Satellites	<ul style="list-style-type: none">• Big/Expensive	<ul style="list-style-type: none">• Small/Cheap
Schedules	<ul style="list-style-type: none">• Long/Years	<ul style="list-style-type: none">• Short/Months
Entry Barriers	<ul style="list-style-type: none">• High	<ul style="list-style-type: none">• Much Lower
Competition	<ul style="list-style-type: none">• None	<ul style="list-style-type: none">• Multiple
Hardware	<ul style="list-style-type: none">• Expendable	<ul style="list-style-type: none">• Reusable
Public Role	<ul style="list-style-type: none">• Spectator	<ul style="list-style-type: none">• Participant
Contract Type	<ul style="list-style-type: none">• Cost Plus	<ul style="list-style-type: none">• Fixed Price/SAA
Risk Tolerance	<ul style="list-style-type: none">• Low	<ul style="list-style-type: none">• High

Space Shuttle & ISS

1981-2012



1999-Present



Paradigm Pioneers

Starting in the 1990's a number of visionary new players entered into the commercial space arena and they brought their own money

Blue Origin - Jeff Bezos - Amazon.com

SpaceX - Elon Musk – PayPal

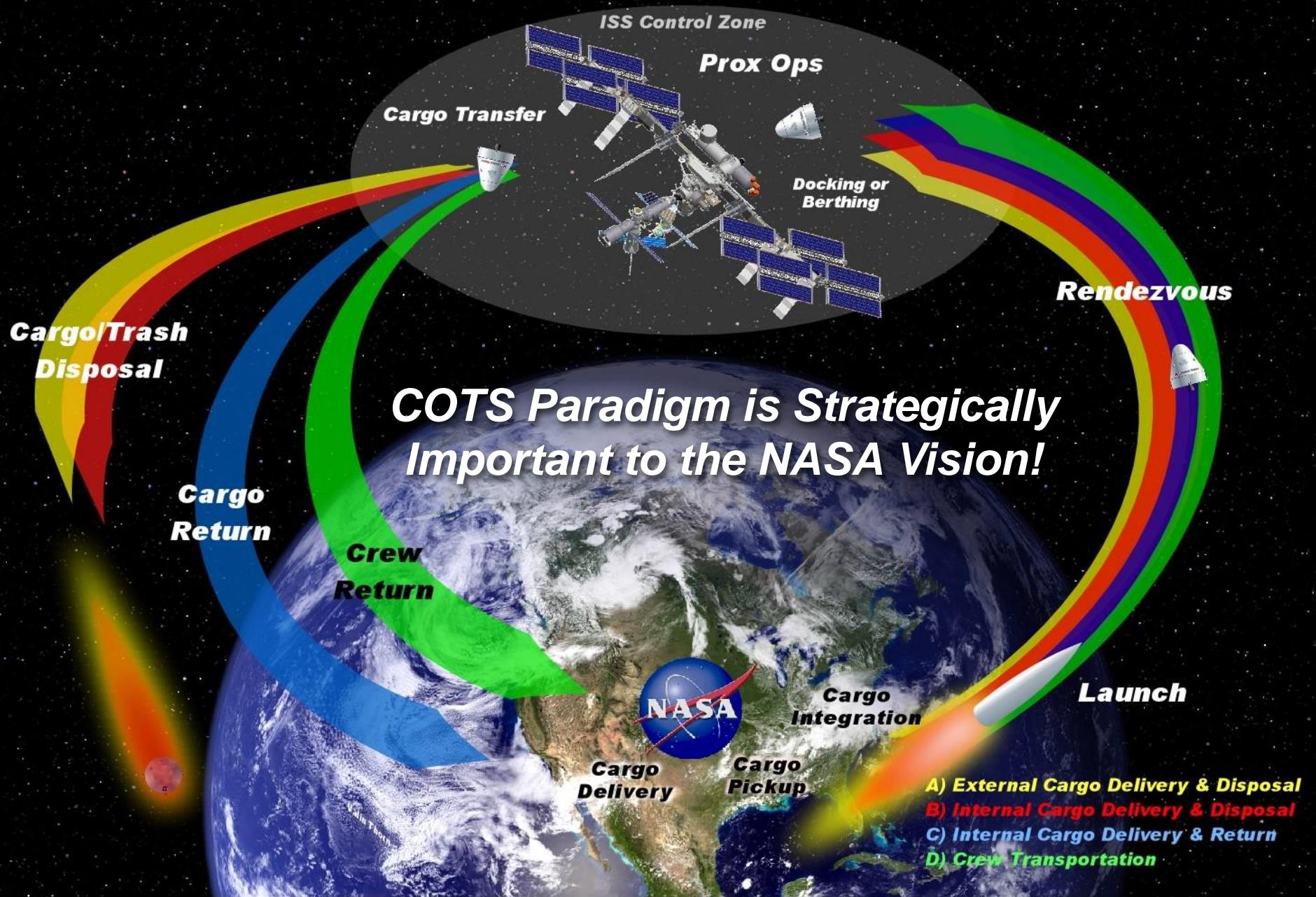
Bigelow Aerospace - Bob Bigelow - Budget Suites of America

Planetary Resources – Peter Diamandis & Eric Anderson with Larry Page, Eric Schmidt – Google plus several others

Virgin Galactic - Richard Branson - Virgin Group

Stratolaunch – Paul Allen – Microsoft/Vulcan Ventures

NASA Commercial Crew/Cargo Project
Commercial Orbital Transportation Service



Elon & SpaceX Falcon



Bezos & Blue Origin



Canada



United Arab Emirates



Luxembourg

Asteroid Mining Will Create A Trillion-Dollar Industry

As our **population** **grows** we need to find a **sustainable supply** of **natural resources** to fuel exploration in space and prosperity on Earth.

MORE ASTEROIDS
DISCOVERED NEAR EARTH EVERYDAY

- + 1,500 EASIER TO REACH THAN MOON
- + 8,800 DISCOVERED TO DATE
- + 1000+ NEARLY 1K+ FOUND EVERY YEAR



USES OF WATER IN SPACE

ROCKET FUEL

BREATHABLE AIR

PLATINUM-RICH ASTEROID

Could contain more Platinum Group Metals than **what's** been mined on Earth in all of history

NEAR-INFINITE SUPPLY OF PRECIOUS RESOURCES



WATER-RICH ASTEROID

One water-rich asteroid could produce enough fuel for every rocket launched in history

ONE SINGLE 500M water-rich asteroid



would produce over \$5 trillion

It currently costs \$20,000 to send a liter of water from Earth to the Moon.

USES OF PLATINUM GROUP METALS ON EARTH

REDUCE COST OF ELECTRONICS



ELECTRIFY TRANSPORTATION



DRIVE INNOVATION, AND CREATE A GREENER EARTH



ONE SINGLE 500M platinum-rich asteroid

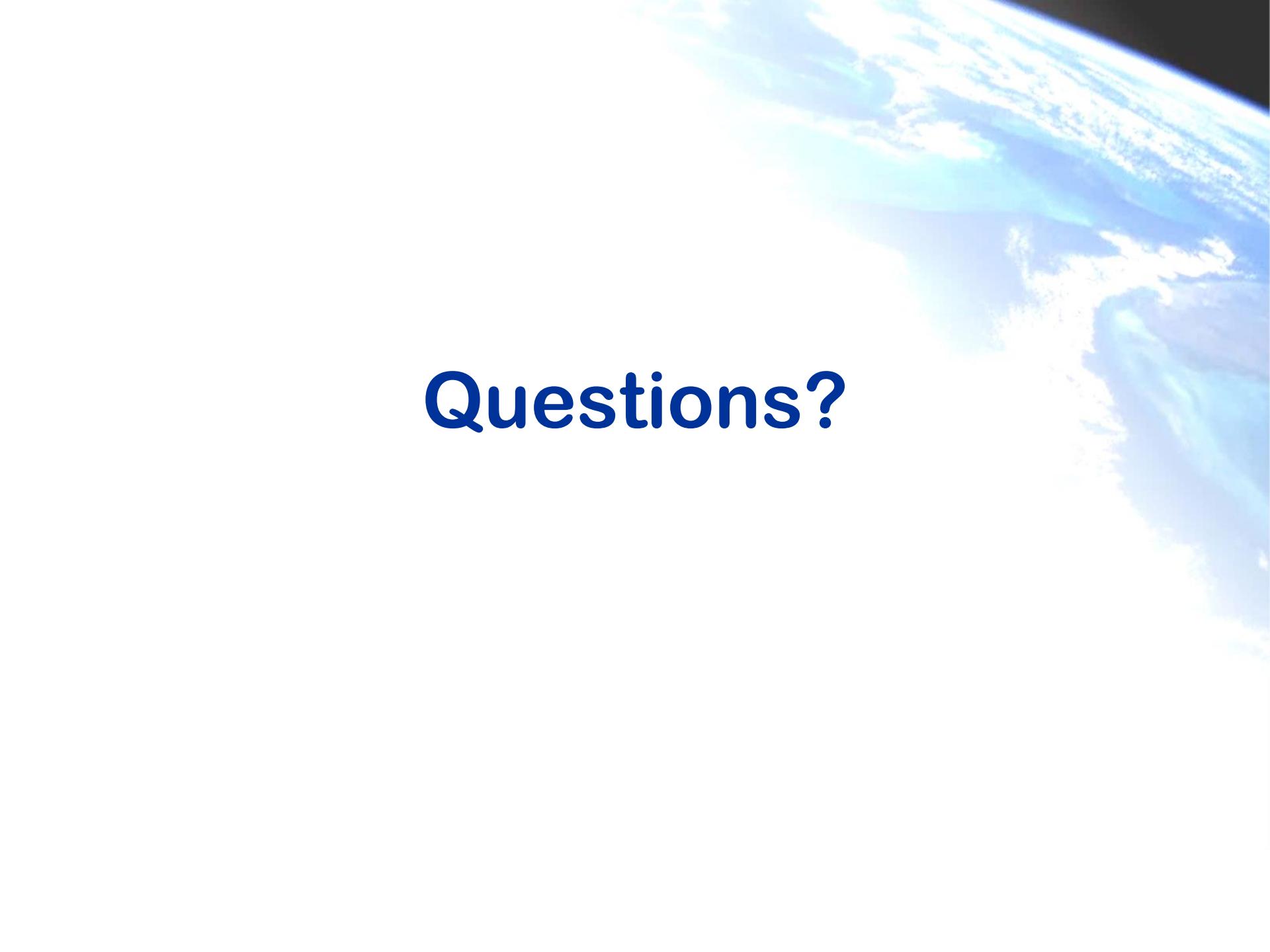
Worth \$2.9 Trillion

174 times more than the yearly world output of platinum

50% More than the known world-reserves of PGMs

At current market prices, one ounce of platinum is valued over \$1,500

Asteroid mining will open a trillion-dollar industry and provide a **near-infinite supply** of Platinum Group Metals and water to **support** our **growth** both on this planet and off.



Questions?